

Description

Sealing strip for the frame structure of a vehicle

The invention relates to a sealing strip according to the preamble to Claim 1.

Such sealing strips are intended to co-operate with the movable pane of the window opening of a vehicle, which pane can move between an open and a closed position. They are used in the region of the C-columns, but also the roof frame of folding roof covers, hardtops and retractable hardtops. The sealing elements come more or less into sealing abutment with the edge regions of the pane depending upon the state of opening of the pane.

As a rule the sealing elements are constructed in such a way that sealing lips are provided on both sides of the pane and butt with a defined prestressing against the pane. This prestressing is designed so that sufficient sealing force is provided but the unavoidable wear is kept within limits.

In the design of the pivoting movement of the pane between the open and the closed position, limiting conditions must be heeded which are contingent upon the configuration of the space available within the door construction. This is often restricted by the wheel cases, so that simple vertical movement of the pane is frequently impossible and a pivoting movement therefore must be arranged which is adapted to these spatial restrictions. This situation must also be taken into account in the design of the sealing strip, namely with the object of ensuring that the sealing lips uniformly cover the pane on both sides as a function of the state of opening of the pane along the pivot curve which is fixed by the design.

A further limiting condition for the sealing strip results from the spatial curvature of the window boundary defined by the respective vehicle.

In the applicants' firm integral sealing strips are known which exhibit a generally U-shaped construction in cross-section and can be fixed on the frame structure of a vehicle, in this case a window enclosure, by way of a central base section. These sealing strips arrive at the

vehicle assembly line in this form, that is to say as a finished product. Because of the aforementioned pivot curve which has to be arranged for the pane, this space - when viewed along the sealing strip - has different depth dimensions so that because of the poor accessibility it is frequently very difficult to carry out subsequent work on functional surfaces which are usually disposed within this space. In individual cases this can lead to reductions in quality and even to defects in the end products.

In practice the contact pressure of the sealing elements or of the sealing lips is determined by design of the dimensions, the shape and the material, wherein sealing surfaces are coated, for example with an antifriction varnish, in order to reduce wear. If the resulting contact force is inadequate or irregular there are no corrective measures available which can be carried out simply in terms of cost.

One requirement for variation of the contact pressure results from the predicted future use of vehicle wash installations in which brush arrangements which move in a rotary or linear fashion are omitted and instead of these systems nozzle arrangements are used from which a cleaning fluid emerges under high pressure. In individual cases sealing arrangements in the window region have proved unsatisfactory in order to withstand the pressure of the impacting cleaning fluid.

The object of the invention is to design a sealing strip of the generic type described above with a view to a qualitatively uniform and reproducibly good end product and also with a view to subsequent changes to the setting. This object is achieved in such a sealing strip by the features of the characterising portion of Claim 1.

According to this it is essential to the invention that the two shaped parts which surround the space of U-shaped cross-section in the sealing strip are in the form of components which are separate from one another and thus arrive at the vehicle assembly line in this separated state. Thus operations which occur after the shaping of the shaped parts can be carried out unhindered by the shape of the sealing strip, so that the production problems which are associated with the restricted accessibility of working surfaces within the said space and its changing depth - when viewed along the sealing strip - do not even occur at all. Thus both

shaped parts can be processed separately from one another until the end product stage is reached. This opens up advantageous possibilities for the provision of a reproducible product quality.

According to the features of Claim 2 at least one of the two shaped parts - when viewed in a direction perpendicular to the surface of the pane - is adjustably fixed on the frame structure or a window enclosure. This means that the contact pressure with which the sealing lips are applied to the pane can be varied by adaptation of the position of at least one of the shaped parts. In this way an irregular contact pressure, irrespective of its cause, on both sides of the pane can be changed or compensated for in a desired manner. Furthermore, in so far as this can be combined with a limitation of the wear and also in circumstances in which it is difficult to operate the opening and closing process of the pane an increased contact pressure can be set so that problems with high-pressure car wash installations are reliably avoided.

According to the features of Claim 3, processing of functional surfaces, e.g. sealing surfaces, can comprise the application of coatings for example in the form of antifriction varnish, fibre coverings, etc.

According to the features of Claim 4 the sealing strip has a spatially curved configuration, wherein the depth dimension of the space with a U-shaped cross-section changes from one end to the other. The spatial curvature as well as the type of change of the said depth dimension are determined by the design data of the respective vehicle.

The features of Claims 5 and 6 are directed to one example of an embodiment of the sealing strip which is simple to implement. At least the shaped part which is disposed so as to be adjustable perpendicular to the pane has an L-shaped cross-section and comprises a base part and a side part, wherein the former is arranged for fixing on the frame structure. The shaped parts are mounted independently of one another on the frame structure and are not directly connected to one another in any case.

The features of Claims 7 to 10 are directed to a further embodiment of the sealing strip in terms of design and materials. Accordingly it is connected to the frame structure with the

proviso that the space delimited by the sealing strip is in any case reliably sealed and protected relative to the outer space. Accordingly the shaped parts can be made from a plastics material, a metal, e.g. high-alloy steel sheet, or in one case from plastics material and in the other case from a metal. Depending upon the dimensions and the structure of the shaped parts an improvement in stability may be expected in the case where the part is made from plastics material over an arrangement of reinforcing ribs.

Due to the releasable fixing of the shaped parts on the frame structure according to Claim 11 subsequent interventions are also possible, in particular readjustments of the sealing lips.

According to the features of Claim 12 the shaped parts are constructed so that they are spatially curved in a manner which is dependent upon the respective vehicle.

The invention is explained in greater detail below with reference to the embodiment of a sealing strip which is illustrated in the attached drawings, in which:

Figure 1 shows a perspective view of a sealing strip according to the invention;

Figure 2 shows a sectional view of the sealing strip in a plane II-II in Figure 1;

Figure 3 shows a sectional view of the sealing strip in a plane III-III in Figure 1.

Two shaped parts which are intended for fixing on a frame structure 3 of the window enclosure of a motor vehicle, in this case in the region of the C-column, are denoted by 1, 2. Both parts are releasably connected to the frame structure and in conjunction with the first one delimit a space 4 with a generally U-shaped cross-section.

The shaped parts 1, 2 are made from a plastics material, e.g. a glass fibre-reinforced PPE (polyphenylene oxide) with a fibre content of for example 20%. However, other plastics materials may also be considered so long as they provide a comparable strength with comparable mass. One of the shaped parts or both shaped parts can also be made from a metal material, e.g. high-alloy steel sheet.

The frame structure 3 which is of double-walled construction and comprises an inner wall 3' and an outer wall 3" delimits a window cut-out 5, wherein the inner wall 3' has an edge portion 6 which extends perpendicular to the planes of these walls and at its end facing the outer wall 3" is connected thereto for example by folding. The frame structure 3 is closed relative to the window cut-out 5 by the edge portion 6.

As can be seen from Figure 1, the depth of the space 4 increases continuously with a depth dimension 7 from one end 8 to the other end 9 of the sealing strip. This depth dimension 7 describes the extent of the shaped part 1, 2 in each case perpendicular to the edge portion 6.

The inner shaped part 2 is constructed as a flat web which extends parallel to the inner wall 3' and is held thereon, for example by screwing, as indicated at the location 10. On its end remote from the edge portion 6 it bears a sealing element 11 on which a sealing lip 12 is formed which extends into the space 4. The lip 12' which can also be seen in the drawing and protrudes into the interior of the vehicle serves principally for decorative purposes.

The outer shaped part 1 has a generally L-shaped contour and comprises a base part 13 which is intended for fixing on the edge portion 6 and extends substantially parallel thereto and a side part 14 which extends substantially perpendicular to the base part 13. Moreover, the side part 14 extends parallel to the outer wall 3" of the frame structure 3. The shaped part 1 bears on its end remote from the edge portion 6 a sealing element 15 on which in turn a sealing lip 16 is formed which extends into the said space 4.

Both sealing lips 12, 16 extend towards one another within the space and are intended to butt against a pane 17 on both sides thereof with a defined contact pressure and thus fulfil a sealing function. The pane 17 extends parallel to the shaped part 2 as well as the side part 14 of the shaped part 1 in a central region of the space 4. It penetrates more or less deeply into this space 4 as a function of an opening or closing movement, as is indicated by the dash-dot representation of the pane.

The sealing elements 11, 15 are made as a whole from an elastomer, e.g. EPDM (ethylene propylene diene elastomer) or also TPE (thermoplastic elastomer). They are produced for example by moulding around the ends of the shaped parts 1, 2 using a shaping tool, the portions of the shaped parts to be moulded around being previously coated with SBR (styrene butadiene elastomer).

The base part 13 is characterised by two supporting ribs 18, 19 which are spaced from one another and extend parallel to one another in the longitudinal direction of the sealing strip and between which are located fixing screws 20 - which are spaced from one another in the longitudinal direction of the sealing strip. These fixing screws 20 each pass through holes in the base part 13 as well as the edge portion 6 and serve for fixing the shaped part 1 on the frame structure 3. It will be recognised that by varying the position of the hole which is

intended to receive a fixing screw 20 in the base part 13 the position of the shaped part 1 can be changed in a simple manner perpendicular to the plane of the pane 17 or to the shaped part 2 and thus in the direction of the arrows 21. In practice the adaptability serves for the orientation of the position of the shaped part 1 relative to the frame structure 3. The mechanical pretension under which the sealing lips butt against the pane 17 can be adjusted by variation of the shaped part 2 in the direction of the arrows 21, for example by washers which co-operate with the screws at the location 10.

For example, for implementation by design of a possibility for adjustment of the shaped part 1 the hole in the base part 13 intended to receive the fixing screw 20 can be an elongate slot, the cross-section of which extends in the direction of the arrows 21.

The part of the supporting rib 19 intended to butt against the edge portion 6 is covered by a sealing profile 22 made from an elastomer such as for example EPDM.

On the end of the shaped part 1 facing the sealing element 15 there is a strip 23 which projects towards the outer face 24 and has a uniform width - when viewed in the longitudinal direction of the sealing strip. The outer face of the strip 23 extends approximately flush with the outer wall 3". The strip 23 is connected to the facing side of the frame structure 3, in this case to the connection point between the inner wall 3' and the outer wall 3", with the interposition of a projection 25 which is covered with a sealing profile 26 made from an elastomer.

The strip 23 formed integrally with the side part 14 is applied as a support for an ornamental strip 23' which is shown by dotted lines in Figures 2 and 3 of the drawings. Towards the outside it forms the closure of the outer wall 3" which in the illustrated embodiment covers the sealing strip on the outside so that externally a smooth aesthetic appearance of the outer wall 3" up to the sealing element 15 is produced. As an alternative to this, however, the strip 23 and thus the shaped part 1 can also be constructed in such a way that a comparable external aesthetic appearance is produced.

Both sealing profiles 22, 26 can be produced in the same way as the said sealing elements 11, 15 by moulding around corresponding structural elements of the shaped parts 1, 2 in conjunction with a shaping tool, whereby in turn the portions to be moulded round are previously coated with SBR.

Due to the two sealing profiles 22, 26 the space 27 defined between the outer face of the side part 14 on the one hand and the inner face of the frame structure on the other hand and thus the interior of the sealing strip is reliably sealed relative to the outer face 24.

The shaped parts 1, 2 equipped with the respective sealing elements 11, 16 arrive individually for assembly on a frame structure 3 and thus it is only in the assembled state that they form a sealing strip which is capable of functioning. Irrespective of the depth of the U-shaped space 4 the shaped parts 1, 2 can be subjected to final processing which for example comprises the application of surface coatings at least to the portions of the sealing lips 12, 16 which interact with the pane. An application of antifriction varnish, a fibre covering etc. may be mentioned merely by way of example. This subsequent processing can be carried out without hindrance.

During assembly of the two shaped parts 1, 2 the contact pressure of the sealing lips on the pane 17 and thus the sealing effect can be varied by readjustment of the position of the shaped part 1 in the direction of the arrows 21. According to the invention this is possible particularly simply since the fixing screw 21 is easily accessible and this adjustment work can be carried out without great outlay. In practice, however, a compromise must always be arrived at between the greatest possible sealing effect on the one hand and still acceptable wear on the other hand.

With the aid of the foregoing statements it will be recognised that the design of the sealing strip according to the invention brings with it advantages in terms of production and moreover a high degree of flexibility in the possibility which is available at any time of readjustment of the contact pressure of the sealing lip on the pane.